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红树林湿地不同植物生境大型  
底栖动物群落研究

Macrofaunal Communities in different  
botanical biotopes in the mangrove wetland

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# 目 录

摘 要 .....	I
ABSTRACT .....	III
第 1 章 前言 .....	1
1.1 大型底栖动物群落生态研究进展 .....	1
1.1.1 国外大型底栖动物生态研究概述 .....	1
1.1.2 国内潮间带大型底栖动物群落生态研究进展 .....	3
1.2 红树林生态系统保护及其底栖动物群落生态研究进展 .....	4
1.2.1 红树林生态系统及保护 .....	4
1.2.2 红树林底栖动物群落生态研究进展 .....	6
1.3 研究意义及技术路线 .....	11
第 2 章 材料与方法 .....	14
2.1 福建漳江口红树林自然保护区概况 .....	14
2.2 广东湛江红树林自然保护区概况 .....	16
2.3 红树林区大型底栖动物取样站概况 .....	17
2.3.1 福建漳江口红树林区取样站点的设置 .....	17
2.3.2 广东湛江红树林区取样站点的设置 .....	18
2.4 大型底栖动物采集、处理过程和数据统计方法 .....	18
2.5 红树林湿地理化因子的测定方法 .....	19
2.5.1 云霄红树林区相关环境因子数据 .....	19
2.5.2 高桥红树林区相关环境因子数据 .....	20
2.6 红树林区大型底栖动物群落结构的分析方法 .....	22
2.6.1 群落结构分析 .....	22
2.6.2 群落物种多样性单变量分析 .....	22
2.6.3 大型底栖动物污染指数 (MPI) .....	23
2.6.4 丰度-生物量比较曲线 .....	24
2.7 红树林区大型底栖动物次级生产力的计算方法 .....	24

2.8 红树林区大型底栖动物功能群的划分方法 .....	25
<b>第 3 章 红树林区不同植物生境的大型底栖动物群落 .....</b>	<b>26</b>
3.1 大型底栖动物组成 .....	26
3.1.1 云霄红树林区大型底栖动物组成 .....	26
3.1.2 高桥红树林区大型底栖动物组成 .....	28
3.2 大型底栖动物栖息密度的时空分布 .....	31
3.2.1 云霄红树林区大型底栖动物栖息密度的时空分布 .....	31
3.2.2 高桥红树林区大型底栖动物栖息密度的时空分布 .....	32
3.3 大型底栖动物生物量的时空分布 .....	33
3.3.1 云霄红树林区大型底栖动物生物量的时空分布 .....	33
3.3.2 高桥红树林区大型底栖动物生物量的时空分布 .....	34
3.4 讨论 .....	35
3.4.1 云霄红树林区与高桥红树林区大型底栖动物群落比较 .....	35
3.4.2 盐沼生境与红树生境大型底栖动物群落比较 .....	36
3.4.3 不同海域红树林区大型底栖动物群落比较 .....	36
<b>第 4 章 不同植物生境大型底栖动物多样性及群落健康评价 .....</b>	<b>38</b>
4.1 云霄红树林区大型底栖动物的丰度指数、多样性指数和 MPI 指数 .....	38
4.2 高桥红树林区大型底栖动物的丰度指数、多样性指数和 MPI 指数 .....	40
4.3 云霄和高桥红树林区部分取样站次的丰度生物量曲线 .....	42
4.4 云霄和高桥红树林区聚类 (CLUSTER) 和 MDS 标序 .....	44
4.4.1 云霄红树林区聚类 (CLUSTER) 和 MDS 标序 .....	44
4.4.2 高桥红树林区聚类 (CLUSTER) 和 MDS 标序 .....	47
4.5 讨论 .....	49
<b>第 5 章 不同植物生境大型底栖动物与环境变量关系研究 .....</b>	<b>52</b>
5.1 云霄红树林区大型底栖动物与环境因子的相关分析 .....	52
5.1.1 与沉积物理化因子的关系分析 .....	52
5.1.2 与沉积物粒径组成及气象因子关系的分析 .....	55
5.2 高桥红树林区大型底栖动物与环境因子的相关分析 .....	56

5.2.1 与沉积物理化因子的关系分析 .....	56
5.2.2 与沉积物粒径组成及气象因子的关系分析 .....	59
5.3 讨论 .....	60
<b>第 6 章 不同植物生境大型底栖动物次级生产力研究 .....</b>	<b>62</b>
6.1 云霄红树林区大型底栖动物次级生产力 .....	62
6.2 高桥红树林区大型底栖动物次级生产力 .....	64
6.3 云霄红树林区大型底栖动物群落次级生产力组成 .....	65
6.4 高桥红树林区大型底栖动物群落次级生产力组成 .....	66
6.5 讨论 .....	67
6.5.1 云霄和高桥红树林区大型底栖动物群落次级生产力的对比 .....	67
6.5.2 云霄和高桥红树林区不同生境下大型底栖动物群落的 P/B 值 .....	68
6.5.3 不同红树林区大型底栖动物群落次级生产力的对比 .....	69
<b>第 7 章 不同植物生境大型底栖动物的功能群组成 .....</b>	<b>70</b>
7.1 功能群的物种组成 .....	70
7.1.1 云霄红树林区大型底栖动物功能群的物种组成 .....	70
7.1.2 高桥红树林区大型底栖动物功能群的物种组成 .....	71
7.2 功能群的密度组成 .....	72
7.2.1 云霄红树林区大型底栖动物功能群的密度组成 .....	72
7.2.2 高桥红树林区大型底栖动物功能群的密度组成 .....	74
7.3 功能群的生物量组成 .....	75
7.3.1 云霄红树林区大型底栖动物功能群的生物量组成 .....	75
7.3.2 高桥红树林区大型底栖动物功能群的生物量组成 .....	77
7.4 功能群的多样性特征 .....	78
7.4.1 云霄红树林区大型底栖动物功能群的多样性特征 .....	78
7.4.2 高桥红树林区大型底栖动物功能群的多样性特征 .....	79
7.5 讨论 .....	80
<b>第 8 章 论文的创新点、不足与展望 .....</b>	<b>82</b>
8.1 创新点 .....	82

8.2 论文的不足之处 .....	82
8.3 展望 .....	82
<b>参考文献 .....</b>	<b>84</b>
<b>附表 1 云霄红树林保护区底栖动物名录 .....</b>	<b>96</b>
<b>附表 2 高桥红树林保护区底栖动物名录 .....</b>	<b>99</b>
<b>参加的课题及发表的文章 .....</b>	<b>102</b>
<b>致 谢 .....</b>	<b>103</b>

## Table of contents

<b>Abstract(In Chinese)</b> .....	<b>I</b>
<b>Abstract(In English)</b> .....	<b>III</b>
<b>Chapter 1 Preface</b> .....	<b>1</b>
<b>1.1 Research progress on ecology of macrofaunal community</b> .....	<b>1</b>
1.1.1 Research progress on ecology of macrofaunal community in the world ..	1
1.1.2 Research progress on ecology of mudflat macrofaunal community in China .....	3
<b>1.2 Mangrove ecosystem protection and research progress on ecology of         zoobenthic community</b> .....	<b>4</b>
1.2.1 Mangrove ecosystem and protection .....	4
1.2.2 Research progress on ecology of zoobenthic community in mangrove	6
<b>1.3 Significance and technological route in this study</b> .....	<b>11</b>
<b>Chapter 2 Materials and methods</b> .....	<b>14</b>
<b>2.1 General situation of Fujian Zhangjiangkou mangrove reserve</b> .....	<b>14</b>
<b>2.2 General situation of Guangdong Zhanjiang mangrove reserve</b> .....	<b>16</b>
<b>2.3 General situation of sampling stations</b> .....	<b>17</b>
2.3.1 Sampling stations of Fujian Zhangjiangkou mangrove reserve .....	17
2.3.2 Sampling stations of Guangdong Zhanjiang mangrove reserve .....	18
<b>2.4 Sampling, laboratory procedures and mathematical statistic methods</b> ..	<b>18</b>
<b>2.5 Measurement methods of environment factors</b> .....	<b>19</b>
2.5.1 Environment factors of Yunxiao mangrove reserve .....	19
2.5.2 Environment factors of Gaoqiao mangrove reserve .....	20
<b>2.6 Methods of statistical analysis</b> .....	<b>22</b>
2.6.1 Analysis methods of macrofaunal community structure .....	22
2.6.2 Univariate variable analysis of species diversity .....	22
2.6.3 Macrofaunal Pollution Index (MPI) .....	23



2.6.4 The curve of abundance biomass comparison .....	24
<b>2.7 Calculation of macrofaunal secondary production .....</b>	<b>24</b>
<b>2.8 Divide of the functional feeding groups of macrofauna .....</b>	<b>25</b>
<b>Chapter 3 Macrofaunal community of different botanical biotopes</b>	
<b>in mangrove reserve .....</b>	<b>26</b>
<b>3.1 Composition of macrofauna .....</b>	<b>26</b>
3.1.1 Composition of macrofauna in Yunxiao mangrove reserve .....	26
3.1.2 Composition of macrofauna in Gaoqiao mangrove reserve .....	28
<b>3.2 Spacial-temporal distrubition of macrofaunal density .....</b>	<b>31</b>
3.2.1 Spacial-temporal distrubition of macrofaunal density in Yunxiao mangrove reserve .....	31
3.2.2 Spacial-temporal distrubition of macrofaunal density in Gaoqiao mangrove reserve .....	32
<b>3.3 Spacial-temporal distrubition of macrofaunal biomass .....</b>	<b>33</b>
3.3.1 Spacial-temporal distrubition of macrofaunal biomass in Yunxiao mangrove reserve .....	33
3.3.2 Spacial-temporal distrubition of macrofaunal biomass in Gaoqiao mangrove reserve .....	34
<b>3.4 Discussion .....</b>	<b>35</b>
3.4.1 Comparison of macrofaunal community between Yunxiao mangrove reserve and Gaoqiao mangrove reserve .....	35
3.4.2 Comparison of macrofauna community between biotopes of the mangrove plants and biotopes of the saltmarsh plants .....	36
3.4.3 Comparison of macrofauna in different mangrove areas .....	36
<b>Chapter 4 Health assessment of macrofaunal community in</b>	
<b>different botanical biotopes .....</b>	<b>38</b>
<b>4.1 The biotic indice of macrofauna in Yunxiao mangrove reserve .....</b>	<b>38</b>
<b>4.2 The biotic indice of macrofauna in Gaoqiao mangrove reserve .....</b>	<b>40</b>

<b>4.3 ABC curve at some samplings .....</b>	<b>42</b>
<b>4.4 CLUSTER and MDS ordination analysis .....</b>	<b>44</b>
4.4.1 CLUSTER and MDS ordination analysis in Yunxiao mangrove reserve ..	44
4.4.2 CLUSTER and MDS ordination analysis in Gaoqiao mangrove reserve ..	47
<b>4.5 Discussion .....</b>	<b>49</b>
<b>Chapter 5 The relationship between macrofauna and environment factors in different botanical biotopes .....</b>	<b>52</b>
<b>5.1 Pearson correlation between macrofauna and environment factors in Yunxiao mangrove reserve .....</b>	<b>52</b>
5.1.1 Pearson correlation between macrofauna and sedimental factors .....	52
5.1.2 The analysis of grain size distributions and meteorologic factors .....	55
<b>5.2 Pearson correlation between macrofauna and environment factors in Gaoqiao mangrove reserve .....</b>	<b>56</b>
5.2.1 Pearson correlation between macrofauna and sedimental factors .....	56
5.2.2 The analysis of grain size distributions and meteorologic factors .....	59
<b>5.3 Discussion .....</b>	<b>60</b>
<b>Chapter 6 Macrofaunal secondary production in different botanical biotopes .....</b>	<b>62</b>
<b>6.1 Macrofaunal secondary production in Yunxiao mangrove reserve .....</b>	<b>62</b>
<b>6.2 Macrofaunal secondary production in Gaoqiao mangrove reserve .....</b>	<b>64</b>
<b>6.3 Composition of macrofaunal secondary production in Yunxiao mangrove reserve .....</b>	<b>65</b>
<b>6.4 Composition of macrofaunal secondary production in Gaoqiao mangrove reserve .....</b>	<b>66</b>
<b>6.5 Discussion .....</b>	<b>67</b>
6.5.1 Comparison of macrofaunal secondary production between Yunxiao and Gaoqiao mangrove reserve .....	67
6.5.2 The value of P/B in different botanical biotopes .....	68

6.5.3 Comparison of macrofaunal secondary production in different mangrove areas .....	69
<b>Chapter 7 Composition of macrofaunal functional feeding groups in different botanical biotopes .....</b>	<b>70</b>
<b>7.1 Species composition of functional feeding groups .....</b>	<b>70</b>
7.1.1 Species composition of functional feeding groups in Yunxiao mangrove reserve .....	70
7.1.2 Species composition of functional feeding groups in Gaoqiao mangrove reserve .....	71
<b>7.2 Density composition of functional feeding groups .....</b>	<b>72</b>
7.2.1 Density composition of functional feeding groups in Yunxiao mangrove reserve .....	72
7.2.2 Density composition of functional feeding groups in Gaoqiao mangrove reserve .....	74
<b>7.3 Biomass composition of functional feeding groups .....</b>	<b>75</b>
7.3.1 Biomass composition of functional feeding groups in Yunxiao mangrove reserve .....	75
7.3.2 Biomass composition of functional feeding groups in Gaoqiao mangrove reserve .....	77
<b>7.4 Diversity characteristics of functional feeding groups .....</b>	<b>78</b>
7.4.1 Diversity characteristics of functional feeding groups in Yunxiao mangrove reserve .....	78
7.4.2 Diversity characteristics of functional feeding groups in Gaoqiao mangrove reserve .....	79
<b>7.5 Discussion .....</b>	<b>80</b>
<b>Chapter 8 Innovation, insufficiency and prospection .....</b>	<b>82</b>
<b>8.1 Innovation .....</b>	<b>82</b>
<b>8.2 Insufficiency .....</b>	<b>82</b>
<b>8.3 Prospection .....</b>	<b>82</b>

<b>Reference .....</b>	<b>84</b>
<b>Appendix 1 Macrofaunal catalogue in Yunxiao mangrove reserve ·</b>	<b>96</b>
<b>Appendix 2 Macrofaunal catalogue in Gaoqiao mangrove reserve ·</b>	<b>99</b>
<b>Task participation and publications .....</b>	<b>102</b>
<b>Acknowledgement .....</b>	<b>103</b>

## 摘 要

近年来,红树林生态恢复和服务功能的研究备受重视。红树林湿地是我国南部沿海潮间带的典型生态系统,大型底栖动物群落是潮间带红树林湿地的重要组成部分,对大型底栖动物群落结构的研究,能够使我们了解潮间带红树林湿地的许多重要生态过程。通过对红树林区不同植物生境下大型底栖动物群落结构、多样性、功能群的研究,可以为红树林生态系统的恢复、保护、开发和管理提供科学依据。

本文选取福建漳江口红树林国家级自然保护区和广东湛江红树林国家级自然保护区为研究区域,于 2010 年对两片红树林区四种不同植物生境进行了大型底栖动物的季度调查,同时测定环境理化因子。采用单变量和多变量的方法分析了不同植物生境大型底栖动物的群落结构、多样性、次级生产力和功能群等的差异。主要研究成果如下:

1. 漳江口云霄红树林区定量取样共获得大型底栖动物 57 种,其中多毛类、甲壳类、腹足类、双壳类分别为 15 种、15 种、14 种和 4 种;互花米草生境获得的大型底栖动物物种数最多,为 36 种。湛江高桥红树林区定量取样共获得大型底栖动物 58 种,其中多毛类、甲壳类、腹足类、双壳类分别为 18 种、18 种、10 种和 3 种;桐花树生境获得的大型底栖动物物种数最多,为 31 种。

2. 云霄红树林区大型底栖动物平均密度为  $3327.2 \text{ ind m}^{-2}$ ,各植物生境密度为互花米草>白骨壤>秋茄>桐花树;大型底栖动物平均生物量为  $24.41 \text{ g m}^{-2}$ ,各植物生境生物量则为白骨壤>秋茄>桐花树>互花米草。高桥红树林区大型底栖动物平均密度为  $2803.0 \text{ ind m}^{-2}$ ,各植物生境密度为桐花树>木榄>无瓣海桑>盐地鼠尾粟;大型底栖动物平均生物量为  $85.43 \text{ g m}^{-2}$ ,各植物生境生物量为桐花树>无瓣海桑>盐地鼠尾粟>木榄。

3. 云霄红树林区大型底栖动物丰富度指数  $d$  为秋茄>白骨壤>互花米草>桐花树;种类多样性指数  $H'$  为桐花树>秋茄>白骨壤>互花米草;大型底栖动物污染指数  $MPI$  则为互花米草>白骨壤>秋茄>桐花树。高桥红树林区大型底栖动物丰富度指数  $d$  为盐地鼠尾粟>无瓣海桑>桐花树>木榄;种类多样性指数

$H'$ 为盐地鼠尾粟>桐花树>木榄>无瓣海桑；大型底栖动物污染指数 MPI 则为木榄>无瓣海桑>桐花树>盐地鼠尾粟。

4. 聚类分析和 MDS 标序结果表明，云霄三种红树植物生境的大型底栖动物群落结构比较相似，互花米草生境与三种红树植物生境的大型底栖动物群落结构相似性较低；高桥三种红树植物生境的大型底栖动物群落结构也较相似，盐地鼠尾粟生境与红树植物生境的大型底栖动物群落结构相似性也较低。可见，盐沼植物生境大型底栖动物群落与红树植物生境大型底栖动物群落不太相似。

5. 云霄红树林区大型底栖动物物种数、丰度指数、均匀度指数、多样性指数与沉积物温度显著负相关；大型底栖动物物种数、丰度指数、均匀度指数、多样性指数与盐度呈显著正相关；大型底栖动物均匀度指数、多样性指数与有机质呈显著相关。高桥红树林区大型底栖动物物种数与沉积物温度、盐度和有机质呈显著相关。

6. 云霄红树林区大型底栖动物平均次级生产力为  $3.79 \text{ g(AFDW)/(m}^2 \text{ a)}$ ，其中各取样生境的大小顺序是白骨壤>互花米草>秋茄>桐花树，各季节大型底栖动物平均次级生产力从高到低的排列顺序是：4 月份>10 月份>1 月份>7 月份；高桥红树林区大型底栖动物平均次级生产力为  $5.34 \text{ g(AFDW)/(m}^2 \text{ a)}$ ，其中各取样生境的大小顺序是桐花树>无瓣海桑>盐地鼠尾粟>木榄，各季节大型底栖动物平均次级生产力从高到低的排列顺序是：7 月份>1 月份>10 月份>4 月份。

7. 云霄各取样生境大型底栖动物物种数均以植食者居多，高桥各取样生境大型底栖动物食性比例不同，如木榄生境杂食者和碎屑食者均为 7 种，桐花树、盐地鼠尾粟、无瓣海桑分别以肉食者、植食者和碎屑食者物种数居多。红树林和互花米草生境大型底栖动物碎屑食者密度占总密度 80% 以上，盐地鼠尾粟生境大型底栖动物浮游生物食者密度占总密度的 50.9%。

关键词：红树林区；大型底栖动物；群落结构；功能群；次级生产力

## Abstract

In recent years, the research on mangrove restoration and ecosystem service become more and more important. The mangrove wetland is a typical ecosystem of coastal intertide zone in south China while the macrofauna community is a crucial part of intertidal mangrove wetland. Through the research on the structure of the macrofauna community, we can learn many important ecological process of intertidal mangrove wetland. To provide scientific basis for the mangrove ecosystem restoration, protection, exploitation and management, we need to realize the structure and the diversity as well as the functional feeding groups of the macrofauna community.

Fujian Zhangjiangkou Mangrove National Nature Reserve and Guangdong Zhanjiang Mangrove National Nature Reserve were chosen as research area. Macrobenthos and environmental factors were investigated seasonally at four different plant biotopes in each mangrove reserve in 2010. The analysis of the differences of the structure, the diversity, the secondary production and the functional feeding group of the macrofauna community among different biotopes of plants was discussed by using univariate and multivariable statistics. The main results are as follows:

1. Fifty-seven species of macrofauna were identified in Yunxiao Zhangjiangkou mangrove reserve. Among them, fifteen species belonged to Polychaeta, fifteen species of Crustacean, fourteen species of Gastropoda and four species of Bivalvia. In the biotope of *Spatina alterniflora*, we collected more macrofaunal species than that in mangrove biotope. Fifty-eight species of macrofauna were identified in Zhanjiang Gaoqiao mangrove reserve. Among them, eighteen species belonged to Polychaeta, eighteen species of Crustacean, ten species of Gastropoda and three species of Bivalvia. In the biotope of *Aegiceras corniculatum*, we collected more macrofaunal species than that in other mangrove biotopes.

2. In Yunxiao mangrove reserve, the average density of macrofauna was 3327.2

ind  $\text{m}^{-2}$  and the average biomass of macrofauna was  $24.41 \text{ g m}^{-2}$ . The highest average density was in the biotope of *Spatina alterniflora* while the lowest was in the biotope of *Aegiceras corniculatum*; the highest average biomass was in the biotope of *Avicennia marina* while the lowest was in the biotope of *Spatina alterniflora*. In Gaoqiao mangrove reserve, the average density of macrofauna was  $2803.0 \text{ ind m}^{-2}$  and the average biomass of macrofauna was  $85.43 \text{ g m}^{-2}$ . The highest average density was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Sporobolus virginicus*; the highest average biomass was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Bruguiera conjugata*.

3. In Yunxiao mangrove reserve, the highest Magalef's index ( $d$ ) was in the biotope of *Kandelia candel* while the lowest was in the biotope of *Aegiceras corniculatum*; the highest Shannon-Wiener diversity index ( $H'$ ) was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Spatina alterniflora*; the highest Macrofaunal Pollution Index (MPI) was in the biotope of *Spatina alterniflora* while the lowest was in the biotope of *Aegiceras corniculatum*. In Gaoqiao mangrove reserve, the highest Magalef's index ( $d$ ) was in the biotope of *Sporobolus virginicus* while the lowest was in the biotope of *Bruguiera conjugata*; the highest Shannon-Wiener diversity index ( $H'$ ) was in the biotope of *Sporobolus virginicus* while the lowest was in the biotope of *Sonneratia apetala*; the highest Macrofaunal Pollution Index (MPI) was in the biotope of *Bruguiera conjugate* while the lowest was in the biotope of *Sporobolus virginicus*.

4. The Bray-Curtis Cluster and MDS analysis showed that: In Yunxiao mangrove reserve, the structure of the macrofauna community in the three biotopes of the mangrove plants were similar, and the differences of the structure of the macrofauna community were exist between the biotope of *Spatina alterniflora* and these three biotopes; we got the same result in Gaoqiao mangrove reserve, the structure of the macrofauna community in the biotope of *Sporobolus virginicus* were much different from the other three biotopes of the mangrove plants. It's thus clear that the structure of the macrofauna community between biotopes of the mangrove plants and biotopes of the saltmarsh plants was different.



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